

CLAIMS

1. A flow generator unit for delivering breathable gas to a patient, including:
 - a flow generator case;
 - a powered gas flow generator within the case;
 - a power supply unit adapted for drop-in assembly in said case, said power supply unit including a printed circuit board, a power input connector rigidly attached to said printed circuit board and a power output connector, and
 - a power supply unit mounting for mounting said power supply unit in said case such that said power input connector aligns with a power input port of said case.
2. A flow generator unit according to claim 1 wherein said power input and power output connectors are attached directly to said printed circuit board.
3. A flow generator unit according to claim 2 wherein said power input and power output connectors are soldered directly to said printed circuit board.
4. A flow generator unit according to claim 1 wherein said power supply unit is received in a power supply compartment of said case, said power supply cavity being sealed against ingress of any liquid present in a flow generator compartment of said case.
5. A blower enclosure for a flow generator used in delivery of breathable gas to a patient, said blower enclosure including a metal container overmoulded with an acoustically damping polymer lining.
6. A blower enclosure according to claim 5 wherein said polymer comprises polypropylene.

7. A blower enclosure according to claim 6 wherein said polymer includes from 10-40% glass fibre.
8. A blower enclosure according to claim 7 wherein said polymer includes about 30% of said glass fibre.
9. A blower enclosure according to claim 8 wherein said glass fibre-filled polymer has similar thermal expansion characteristics to said metal container.
10. A blower enclosure according to claim 5 wherein said metal container is a steel tub.
11. A blower enclosure according to claim 5 wherein said polymer lining is overmoulded onto inner and outer surfaces of said metal container.
12. A blower enclosure according to claim 11 wherein said polymer lining of said container inner surface includes formations for engagement of a motor housing.
13. A blower enclosure for a flow generator used in delivery of breathable gas to a patient, said blower enclosure being adapted to reduce noise from the enclosed blower, said enclosure comprising:
 - (i) a cavity within a chassis of the flow generator, the cavity defined by side walls and base, the enclosure being adapted to receive and mount a blower in said cavity and
 - (ii) a lid adapted to be mounted on said chassis so as to form a top surface of the cavity,wherein at least one of the chassis and lid is moulded from a composite comprising a metal and a plastic.
14. A blower enclosure as claimed in claim 13, the metal and the plastic being adapted to have generally similar coefficients of thermal expansion.

15. The blower enclosure of claim 13 wherein the metal and plastic are co-moulded.
16. The blower enclosure of claim 13 wherein the metal is nickel-plated mild steel.
17. The blower enclosure of claim 13 wherein the plastic is polypropylene.
18. The blower enclosure of claim 17 wherein the polypropylene includes a glass filling.
19. A blower enclosure according to claim 18 wherein the glass filling is glass fibre,
20. A blower enclosure according to claim 19 wherein said polypropylene includes from 10-40% glass fibre.
21. A blower enclosure according to claim 20 wherein said polymer includes about 30% of said glass fibre.
22. A blower for a flow generator used in delivery of breathable gas to a patient, said blower comprising an electric motor with a shaft, an impeller adapted to be mounted on the shaft, and a volute having an air-inlet and an air-outlet, the volute defining a chamber in which a flow of air at pressure is developed, the volute being moulded from a composite comprising a first plastic material and a second plastic material, the first plastic material being generally rigid and the second plastic material being generally elastomeric.
23. A blower as claimed in claim 22 wherein the volute comprises an upper volute and a lower volute.
24. A blower as claimed in claim 23 wherein the lower volute incorporates the air-inlet.

25. A blower as claimed in claim 24 wherein the lower volute includes feet.
26. A blower as claimed in claim 25 wherein the feet are moulded from the second plastics material.
27. A blower as claimed in claim 23 wherein the lower volute is adapted to be spring-mounted.
28. A blower as claimed in claim 23 wherein the upper volute incorporates the air-outlet.
29. A blower as claimed in claim 28 wherein the upper volute includes a seal constructed from the second plastic material and which in use is adapted to provide a seal between the upper and lower volutes.
30. A blower as claimed in claim 22 wherein the first plastic material is overmoulded with the second plastic material.
31. A blower as claimed in claim 22 wherein the first plastic material is a blend of polycarbonate and ABS.
32. A blower as claimed in claim 22 wherein the second plastic material is thermoplastic elastomer.
33. A blower as claimed in claim 23 wherein the upper and lower volutes are adapted to be snap-fit together.
34. A flow generator case for a flow generator used in delivery of breathable gas to a patient, said flow generator case comprising a shell of rigid plastics overmoulded with an elastomeric lining.

35. A flow generator case according to claim 34 wherein said elastomeric lining forms external feet of said flow generator case.
36. A flow generator case according to claim 34 wherein said elastomeric lining forms an internal surface of a cavity of said flow generator case.
37. A flow generator case according to claim 34 wherein said flow generator case includes first and second parts and said elastomeric lining forms a seal between said first and second parts.
38. A fan support arrangement for a flow generator used in delivery of breathable gas to a patient, including a fan housing containing a motor and fan, said support arrangement including a plurality of mounting springs, wherein said springs, fan housing, motor and fan form a spring system having a natural resonant frequency less than one tenth of the frequency of a lowest operating speed of said fan.
39. A fan support arrangement according to claim 38 wherein said mounting springs are metal mounting springs.
40. A flow generator unit for delivering breathable gas to a patient, including a flow generator case having an air outlet, a fan volute contained within said case, further including a flexible tube connecting an outlet of said fan volute to said air outlet, said flexible tube having two or more corrugations therein.
41. A flow generator and humidifier combination for continuous positive airway pressure treatment of a patient, including a flow generator and a humidifier removably attached to the flow generator, wherein said flow generator includes a humidifier attachment detector including an optical transmitter and an optical sensor and wherein said humidifier includes an optical path connector which, when said flow generator and humidifier are attached, completes an optical path between said optical transmitter and said optical sensor.

42. A flow generator and humidifier combination according to claim 41 wherein said optical path connector includes a reflector for reflecting light transmitted by said transmitter to said sensor.
43. A flow generator and humidifier combination according to claim 42 wherein said reflector is a curved reflector in a case of said humidifier.
44. A muffler arrangement in an air flow path of a flow generator used in delivery of breathable gas to a patient, including a first muffler volume, a second muffler volume and a connecting portion linking said first and second muffler portions, wherein said connecting portion is narrow relative to said muffler portions and includes a lead-in portion which narrows in a direction away from said first muffler portion.
45. A muffler arrangement according to claim 44 wherein said connecting portion includes a venturi.
46. A handle assembly for a flow generator used in delivery of breathable gas to a patient, including a flow generator case, a handle including a pair of attachment arms, each attachment arm having a projection received in a respective track of said case, and a handle retention member which attaches to said case to retain said handle projections against travel along said track.
47. A handle assembly according to claim 46 wherein said handle retention member is a cover plate which attaches which forms a part of the exterior of said case.
48. A handle assembly according to claim 46 or 47 wherein said handle retention member has retaining projections extending into said tracks to limit travel of said handle projections along said tracks.

49. A handle assembly according to claim 46 wherein said handle retention member retains said handle projections adjacent a closed end of said tracks.
50. A method of attachment of a handle to a flow generator case, said handle including a pair of attachment arms, each attachment arm having a projection received in a respective track of said case, including the steps of sliding said handle projections along respective of said tracks and attaching a handle retention member to said case to retain said projections against travel along said respective tracks.
51. A method according to claim 50 wherein said sliding of said handle projections along said track occurs without substantial distortion of said attachment arms.
52. A humidifier for delivering humidified breathable gas to a patient, including a humidifier case,
a water container,
a heater located in heat transfer communication with said water container,
a gas flow path including a gas inlet, a humidified gas outlet and an intermediate gas flow path which contacts the gas with water vapour from said container,
further including a drainage opening adjacent said heater allowing drainage of water past the heater to exit said humidifier case.
53. A humidifier according to claim 52 wherein said heater includes a heater pad located in a bottom portion of said case, the bottom portion of said case being open so as to provide said drainage opening.
54. A humidifier according to claim 53 wherein said drainage opening is a generally U-shaped opening surrounding said heater pad.
55. A humidifier for delivering humidified breathable gas to a patient, including
a humidifier case,
a water container,

a heater pad located in heat transfer communication with said water container, a gas flow path including a gas inlet, a humidified gas outlet and an intermediate gas flow path which contacts the gas with water vapour from said container, wherein said heater pad has an upper heating surface and a peripheral heating surface which includes a side wall of said heater pad, and wherein a heat transfer surface of said water container is shaped to correspond to said heater pad so as maintain close heat transfer communication with said upper heating surface and peripheral heating surface of said heater pad.

56. A humidifier according to claim 55, wherein said heat transfer surface of the water container includes a generally horizontal portion corresponding to said upper heating surface and a generally vertical portion below the horizontal portion corresponding to said peripheral heating surface.
57. A humidifier according to claim 56 wherein said water container defines a water volume which extends both above and below a level of said heating pad upper heating surface.
58. A humidifier according to said 57 wherein a base of said water container includes a raised portion of said base having said generally horizontal portion and a lower portion of said base having said generally vertical portion.
59. A humidifier according to claim 58 wherein said generally vertical portion is formed as one or more side walls of said lower portion of said base.
60. A humidifier according to claim 58 wherein said lower portion of said base portion is formed generally as a U-shape about said heater pad.
61. A humidifier for delivering humidified breathable gas to a patient, including a humidifier case having a hinged lid,
a water container adapted for drop-in assembly in said case,
a heater in heat transfer communication with said water container,

a gas flow path including a gas inlet, a humidified gas outlet and an intermediate gas flow path which contacts the gas with water vapour from said container, wherein said water container has a gas passage inlet communicating with said gas flow path,

said humidifier further including a gas passage inlet seal for sealing connection said gas passage inlet to said gas flow path, wherein said sealing connection is actuated by drop-in assembly of said water container and hinged closing of said lid.

62. A humidifier according to claim 61, wherein said gas passage inlet is located on a rear face of said water container and aligns with a gas passage aperture on an opposed face of said case.

63. A humidifier according to claim 62, wherein closing of said lid pushes said water container rearwards to actuate said sealing between the gas passage inlet of the water container and said gas passage aperture of said case.

64. A humidifier according to claim 63, wherein said gas passage inlet seal is attached to said gas passage aperture and wherein closing said lid pushes the water container onto said gas passage inlet seal causing sealing contact between said seal and said rear face in a locus surrounding said gas passage inlet.

65. In a humidifier assembly for a flow generator used in delivery of a supply of breathable gas to a patient for treatment of sleep disordered breathing, the humidifier assembly comprising a water tub having an inlet, a base having a blower outlet and a water-tub-receiving-portion, and a hinged lid with an engagable locking mechanism, a method of forming a seal between the water tub inlet and the blower outlet of the base comprising the steps of:

- (i) placing the water tub in the tub-receiving-portion of the base so as to position the inlet and the outlet adjacent one another;
- (ii) closing the hinged lid; and
- (iii) engaging the locking mechanism.

66. The method of claim 65 wherein the blower outlet includes front-facing seal forming surface.
67. The method of claim 66 whereby the step of placing the water tub in the water-tub-receiving portion of the base further includes the step of placing the water tub against the seal forming surface of the blower outlet.
68. The method of claim 65 wherein the hinged lid further comprises a generally cylindrical portion adapted to mate with an air delivery conduit so that the supply of breathable gas can be provided to a patient interface.
69. In a humidifier assembly for a flow generator used in delivery of a supply of breathable gas to a patient for treatment of sleep disordered breathing, the humidifier assembly comprising a water tub having an air outlet and an hinged lid with an engagable locking mechanism and an air delivery portion adapted to mate with an air delivery conduit so that the supply of breathable gas can be provided to a patient interface, a method of forming a seal between the water tub air outlet and the air delivery portion comprising the steps of:
- (i) closing the hinged lid; and
 - (ii) engaging the locking mechanism.
70. The method of claim 69 wherein the hinged lid has an underside, and the underside includes a seal forming surface.
71. The method of claim 70 wherein the seal forming surface comprises a removably attachable gasket.
72. The method of claim 71 wherein the removably attachable gasket is formed of silicone.

73. A humidifier assembly for a flow generator used in delivery of a supply of breathable gas to a patient for treatment of sleep disordered breathing, the humidifier assembly comprising a water tub having an air inlet and an air outlet, a humidifier base having a blower outlet and a water-tub-receiving portion, and a lid having an air delivery portion adapted to mate with an air delivery conduit so that the supply of breathable gas can be provided to a patient interface, wherein said water-tub-receiving portion and water tub have complementary formations adapted to guide drop-in positioning of said water tub to align said air inlet with said blower outlet.
74. A humidifier according to claim 73 wherein said complementary formations further guide positioning of said water tub to align said air outlet with a position of said air delivery portion of said lid when said lid is closed.
75. A humidifier for delivering humidified breathable gas to a patient, including
a humidifier case having a lid,
a water container within said case,
a heater in heat transfer communication with said water container,
a gas flow path including a gas inlet, a humidified gas outlet in said lid and an intermediate gas flow path which contacts the gas with water vapour from said container, and
a gas outlet seal operatively associated with said lid whereby closing said lid creates a sealed communication between said humidified gas outlet the seal and a gas space of said water container.
76. A humidifier according to claim 75 wherein said gas outlet seal is attached to an underside of said lid and contacts said water container when said lid is closed.
77. A humidifier according to claim 76 wherein said gas outlet seal contacts an upper surface of said water container in locus surrounding an outlet of said gas space.

78. A humidifier according to claim 77 wherein said lid is hinged to said case.
79. A humidifier according to claim 76 further including a gas passage seal attached to the underside of said lid cooperating with a surface of said water container to form a sealed gas passage between a gas passage inlet and a gas inlet to said gas space.
80. A humidifier according to claim 79 wherein said water container surface forming said sealed gas passage includes a channel in an upper surface of said water container.
81. A humidifier according to claim 79 wherein said gas outlet seal and said gas passage seal are integrally formed.
82. A humidifier for delivering humidified breathable gas to a patient, including
a water container,
a heater in heat transfer communication with said water container,
a gas flow path including a gas inlet, a humidified gas outlet in said lid and an intermediate gas flow path which contacts the gas with water vapour from said container,
wherein said intermediate gas flow path includes a gas passage between a gas passage inlet and a gas inlet to said gas space, said gas passage having a floor sloping downwards from said gas passage inlet to said gas inlet.
83. A humidifier according to claim 82 wherein said gas passage includes a drainage portion below a level of the gas passage inlet.
84. A humidifier according to claim 83 wherein said drainage portion is a forwardmost portion of said gas passage having a front wall below the level of the gas passage inlet.

85. A humidifier according to claim 84 wherein said gas passage is substantially U-shaped.
86. A humidifier according to claim 82 wherein said gas passage includes a channel in an upper surface of said water container.
87. A humidifier for delivering humidified breathable gas to a patient, including a water container,
a gas flow path including a gas inlet, a humidified gas outlet in said lid and an intermediate gas flow path which contacts the gas with water vapour from said container,
wherein said gas flow path is adapted to introduce said gas into a headspace of said water container with a swirling motion.
88. A humidifier according to claim 87 wherein said intermediate gas flow path includes a container air inlet adapted to introduce gas generally tangentially into said container headspace.
89. A humidifier according to claim 88 wherein said intermediate gas flow path includes an arcuate gas flow path leading to said container air inlet.
90. A humidifier according to claim 88 further including a container air outlet positioned generally centrally of said headspace.
91. A control circuit for a humidifier for delivering humidified breathable gas to a patient, including a user operable control for selecting a desired gas humidity setting and a heater control circuit for determining a target heater temperature corresponding to the humidity setting and controlling a heater to attain said temperature, wherein said user operable control includes an off setting for which said heater control selects a target heater temperature less than a lowest operating temperature of said humidifier.

92. A flow generator for delivering breathable gas to a patient, including
a processor, a timer, user input means and a display, said processor being
programmed to receive a reminder request input and to generate a reminder
display at a time specified in said reminder request input.
93. A flow generator according to claim 92 wherein said processor is adapted to
generate a display relating to a reminder event relating to one or more of a mask
replacement reminder, a data capture reminder, a filter replacement reminder and a
reminder to contact a health care professional.
94. A flow generator according to claim 92 or 93 wherein said processor is adapted to
cancel a reminder request upon receiving a cancellation input from said user input
means.
95. A modular data or electrical connector arrangement for a flow generator unit for
delivering breathable gas to a patient, including:
a flow generator case including an aperture;
a gas flow generator;
a control circuit for said flow generator, said circuit including a connector
positioned to be accessible through said aperture for data or electrical
communication with an external device; and
a plurality of closure modules each adapted to attach to said case to cover said
aperture, at least one of said closure modules including an internal connector
adapted to connect with said control circuit connector, an external data or
electrical port adapted for connection to said external device and a data or
electrical pathway between said internal and external connectors.